MICHIGAN'S WOOD BIOMASS INVENTORY

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Forest Resource Management

- Gather, Analyze & Disseminate Relevant Information
- Make the tie to Sustainable Management & Community Economic Growth
- Management Responsibilities for 3.9 Million Acres of State Forest Lands

Partners

- Michigan State University
- USDA Forest Service
- Michigan Technological University
- Michigan Biomass Energy Program
- SE Michigan RC&D Council
- Industry and Other Interested Parties

Why Wood Resource Inventories are Needed

Will show:

- Best economic options for processing & recycling wood
- Data for long-term, sustainable business plans
- Opportunities for new markets

Presentation Overview

- What is Woody Biomass
- Sources of Woody Biomass
- Current Uses & Markets for Woody Biomass
- Other Issues Related to Woody Biomass
- The Future

What is Woody Biomass

- Biomass is simply any organic material – living or dead
- Woody biomass includes entire living & dead trees, brush, stems, logs & residue material generated throughout various forest product processing

Woody Biomass

Forest product industries normally focus on a portion of the forest resource – sawlogs & pulpwood – without looking at other value added markets, such as:

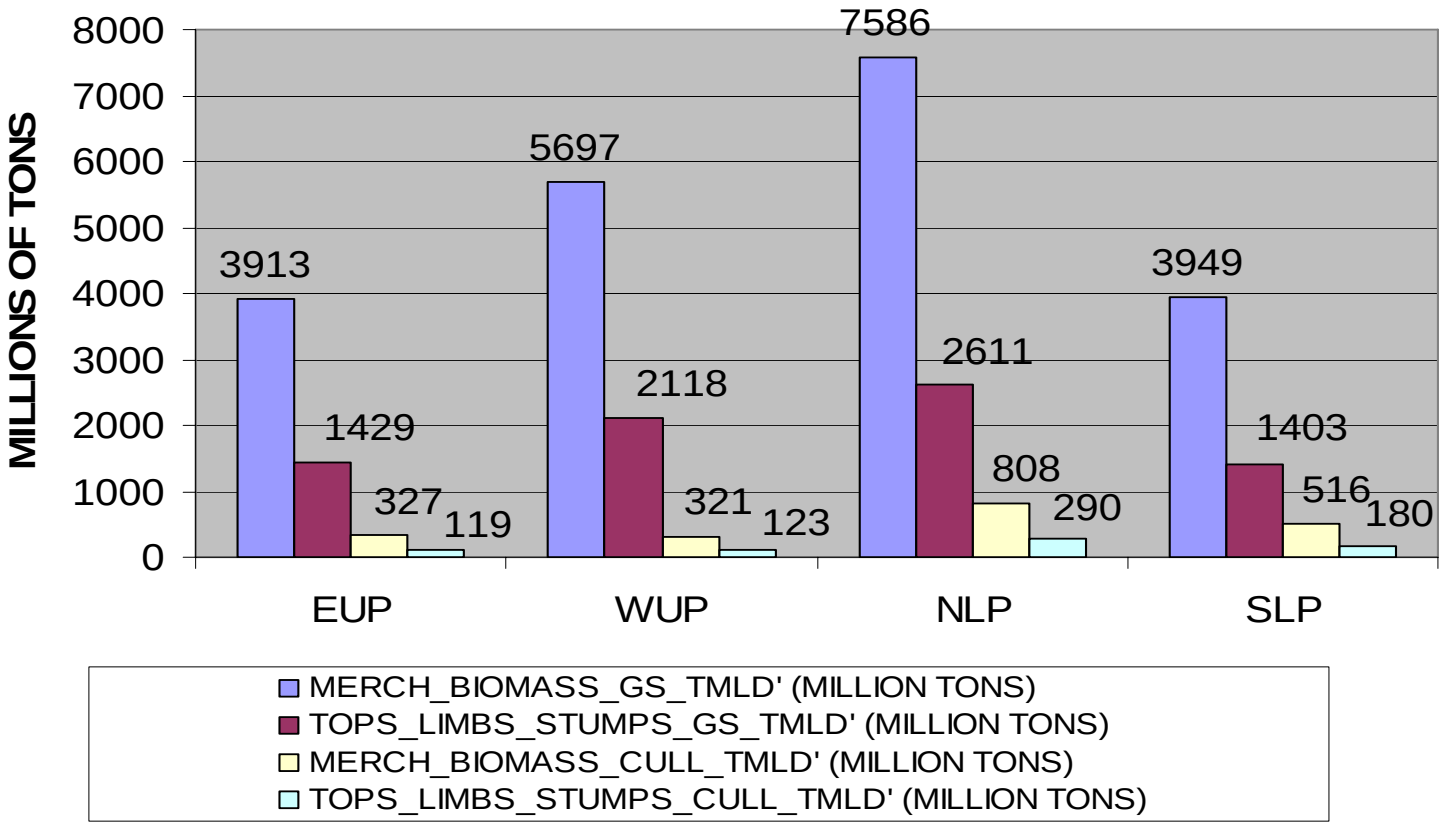
- Tops, limbs, & brush
- Small diameter timber
- Wood manufacturing residues
- Urban wood

These are key opportunities for biomass energy.

Woody Biomass Sources

TOTAL WOODY BIOMASS ON TIMBERLAND IN MICHIGAN *

(2005 FOREST INVENTORY ANALYSIS)



* Physical Presence of Biomass Not Biomass Availability

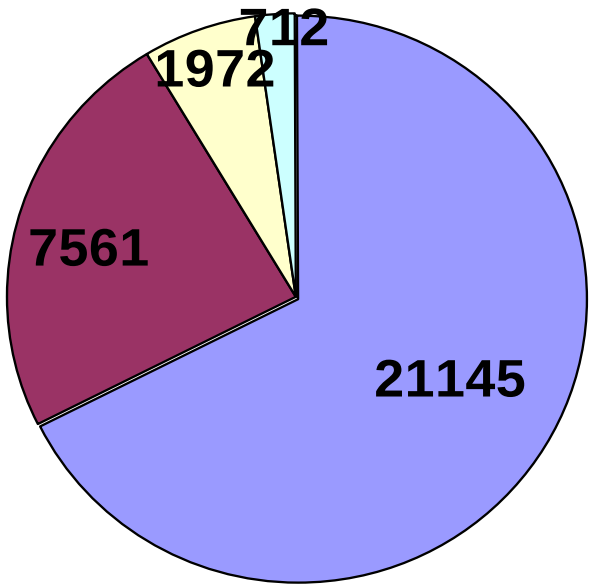
Woody Biomass Availability

- Land owner Values (over half is on private lands)
- Price
- Sustainable requirements
- Competing Uses
- Changing Markets

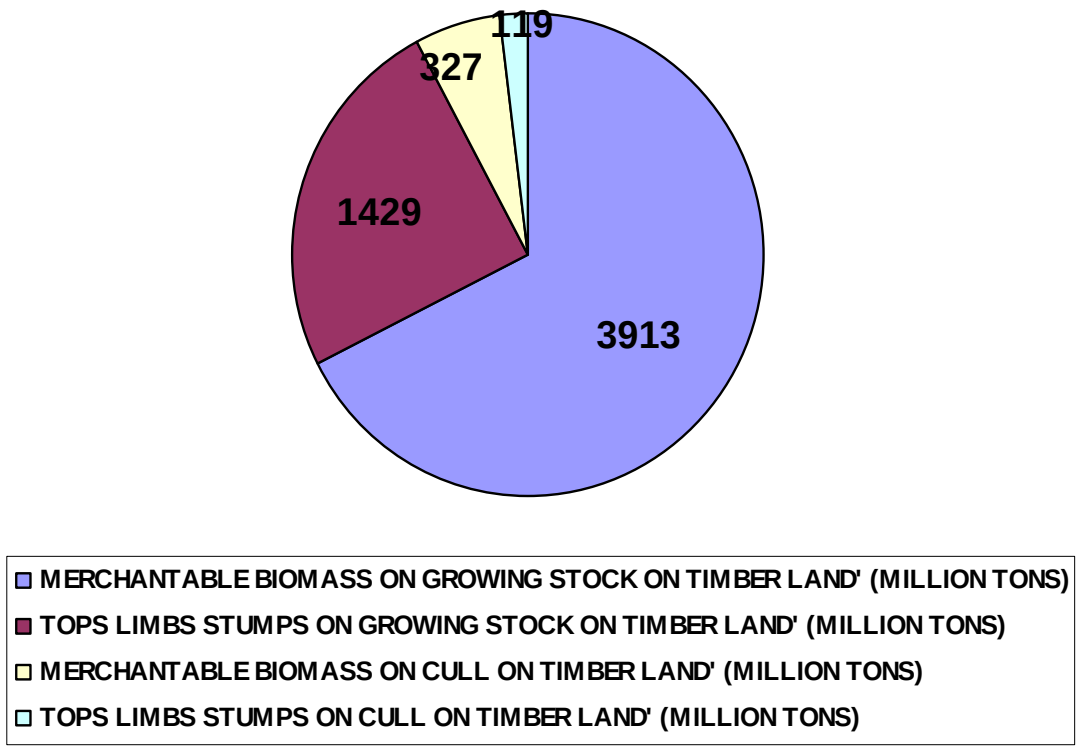
Additional Biomass Potential

- Utilization of Non-Commercial Species (not in FIA Data)
- Hybrid Plantations (e.g. hybrid poplar, willow)

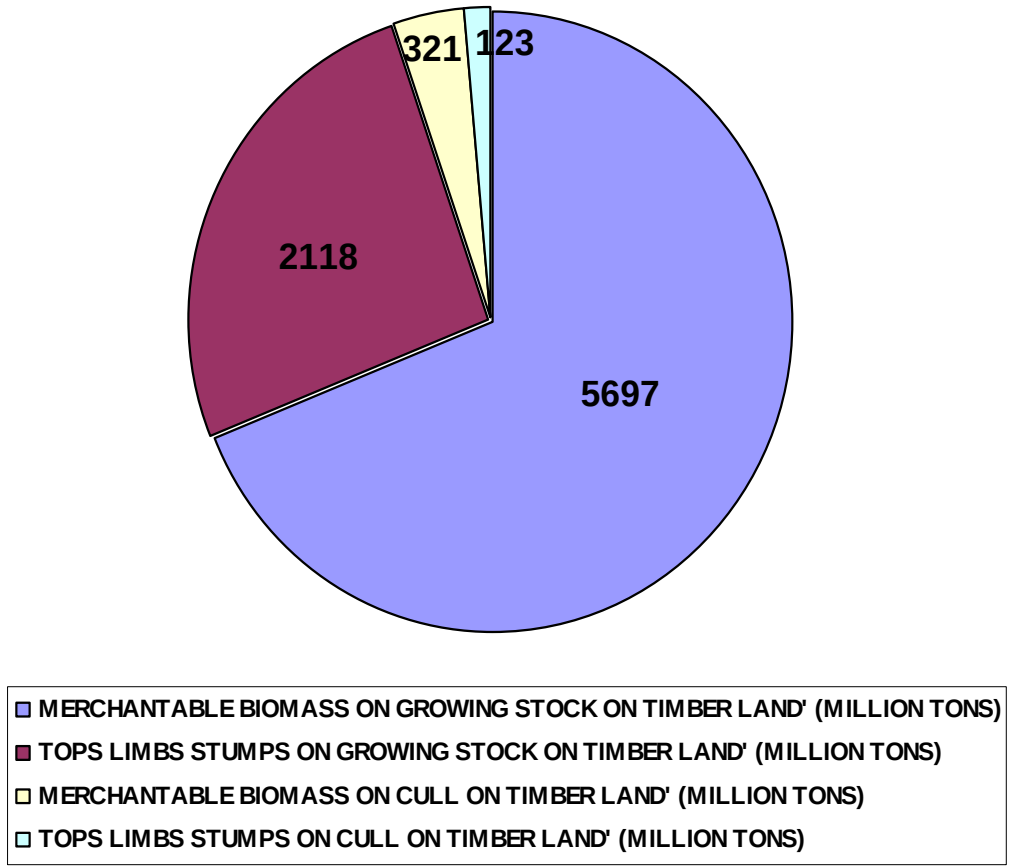
WOODY BIOMASS ON TIMBERLAND IN MICHIGAN (2004 FIA)



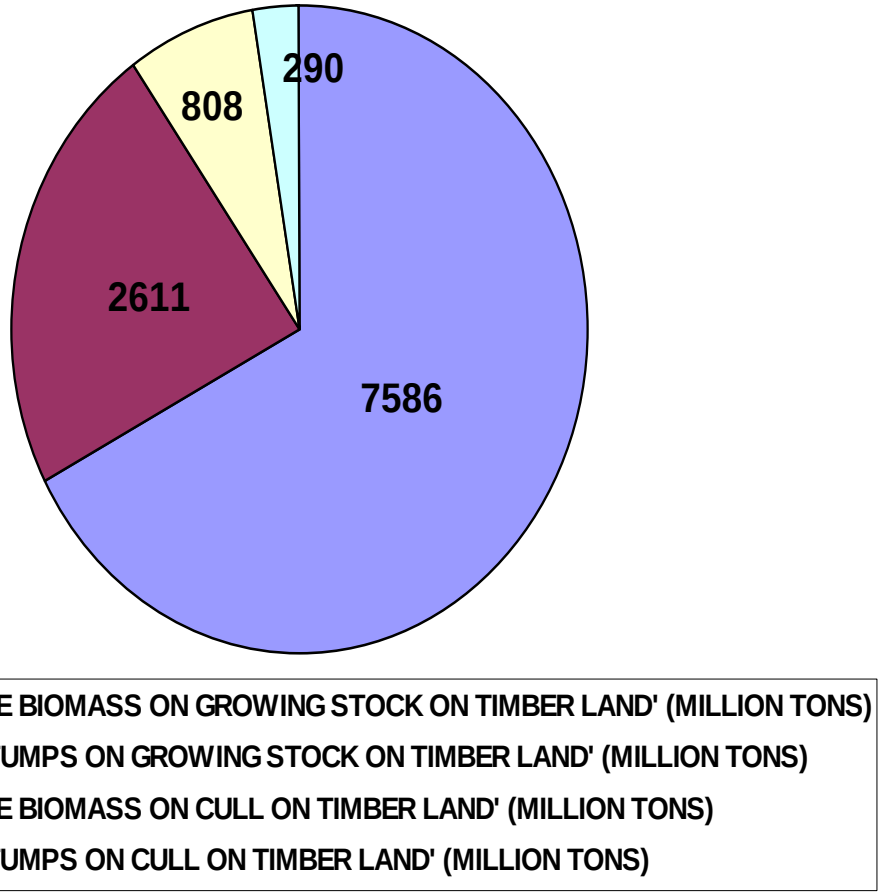
WOODY BIOMASS ON TIMBERLAND IN EASTERN UPPER PENINSULA OF MICHIGAN (2004 FIA)



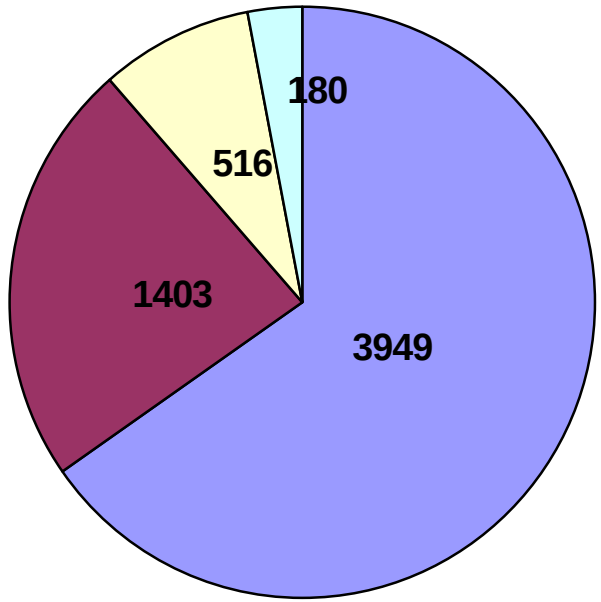
WOODY BIOMASS ON TIMBERLAND IN WESTERN UPPER PENINSULA OF MICHIGAN (2004 FIA)



WOODY BIOMASS ON TIMBERLAND IN NORTHERN LOWER PENINSULA OF MICHIGAN (2004 FIA)



WOODY BIOMASS ON TIMBERLAND IN SOUTHERN LOWER PENINSULA OF MICHIGAN (2004 FIA)



- MERCHANTABLE BIOMASS ON GROWING STOCK ON TIMBER LAND' (MILLION TONS)
- TOPS LIMBS STUMPS ON GROWING STOCK ON TIMBER LAND' (MILLION TONS)
- MERCHANTABLE BIOMASS ON CULL ON TIMBER LAND' (MILLION TONS)
- TOPS LIMBS STUMPS ON CULL ON TIMBER LAND' (MILLION TONS)

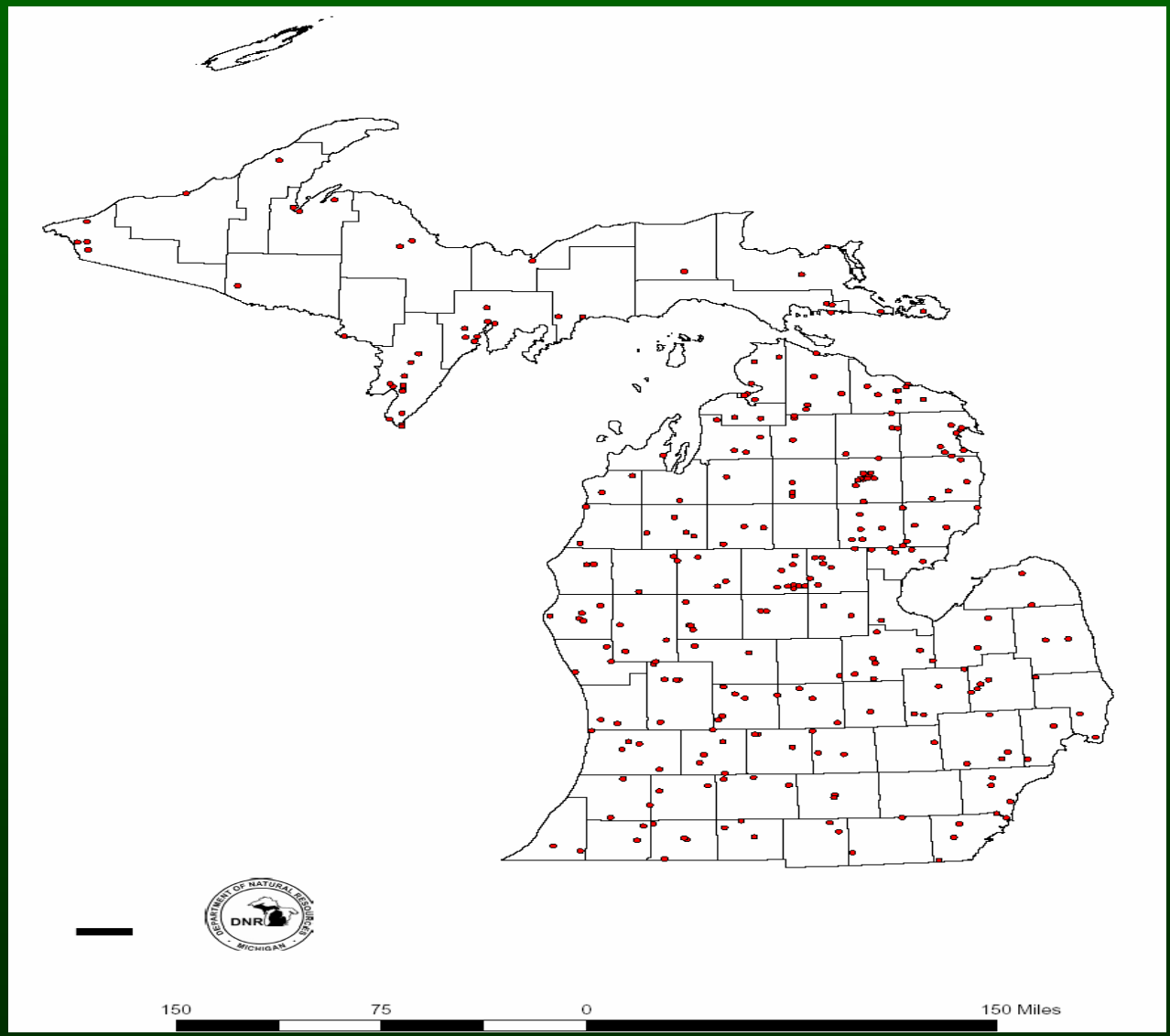
Table 3—Annual Biomass Quantities in Michigan (est. dry tons), by Type and Delivered Price[47]

Biomass Type	< $20/dry ton	< $30/dry ton	< $40/dry ton	< $50/dry ton
Urban Wood Residue	495,734	826,224	826,224	826,224
Mill Residue	10,000	932,000	*1,248,000 (est)*	1,564,000
Forest Residue	0	710,000	1,034,000	1,327,900
Energy Crops	0	0	1,154,228	4,179,308
Ag Residues	0	0	680,783	4,265,671

Simpkins, Dulcey. 2006. Clean Energy from Wood Residues in Michigan. Michigan Biomass Energy Program.

Woody Biomass Resource
Current Uses & Markets

Primary Mills



While many mills utilize or market their own residues, others remain a potential source of additional woody biomass.

Urban Wood Residue Sources

- Tree removals & trimmings (logs, limbs, stumps)
- Manufacturing byproducts (edgings, cutoffs, chips, shavings)
- Discarded packaging (pallets, skids, crates, dunnage)
- Construction/demolition
- Railroad ties
- Telephone poles

MI Urban Wood Estimates

2007 SEMIRCD Study – Sherrill & MacFarlane

- Studied green & brown urban wood residues
- To be released in spring 2007

1994 Public Policy Associates study –

Urban Wood Waste in Michigan Supply & Policy Issues

- 659,328 tons, 45% utilized
- 8,848,527 MBtus

1999 Oak Ridge National Laboratory study –

Biomass Feedstock Availability in the U.S.

- Estimated 826,224 dry tons/yr
- Delivered price of <$30/dry ton

Biomass Energy from Wood

- Renewable
- Local
- Reliable
- Sustainable
- Affordable
- Low carbon emission
- Minimal ash
- Very low metals and sulfur

- **Good option for schools, hospitals, and other institutions facing high energy costs**
- **Can be used through new construction or boiler retrofit**

Table 2—Wood Energy Characteristics, Merits, and Technology Options

Resource	Energy Characteristics	Advantages	Disadvantages	Technology
Wood and wood residue	▪ green wood: 4,800 Btu/lb (45% moisture content, wet basis) ▪ dry mill residue (brown wood): 6930 btu/lb (13% moisture content, wet basis) ▪ pellets or briquettes: 8000-9000 btu/lb (8% moisture content, wet basis ▪ wood-to-ethanol life cycle fossil energy ratio: 14-29:1	▪ renewable, locally abundant ▪ dispatchable (storable), not intermittent (solar, wind) ▪ known technology for heating, boilers, co-firing ▪ much cleaner than coal, carbon neutral if harvested sustainably ▪ pollution prevention for wood industry and processing ▪ prevents landfilling of organics ▪ improved forest health, reduced impact of fires, insects, diseases	▪ lower energy content than non-renewable fossil fuels ▪ can be expensive to transport ▪ requires storage space ▪ must be dried for some energy applications ▪ can be contaminated ▪ lack of consensus on sustainability	**NOW** ▪ wood fired boilers ▪ wood and coal co-fired boilers ▪ co-firing with other biomass ▪ pyrolytic oils (bio-oils) **FUTURE** ▪ wood-to-ethanol ▪ syn-fuels

Simpkins, Dulcey. 2006. Clean Energy from Wood Residues in Michigan. Michigan Biomass Energy Program.

Wood Energy Facilities in Michigan

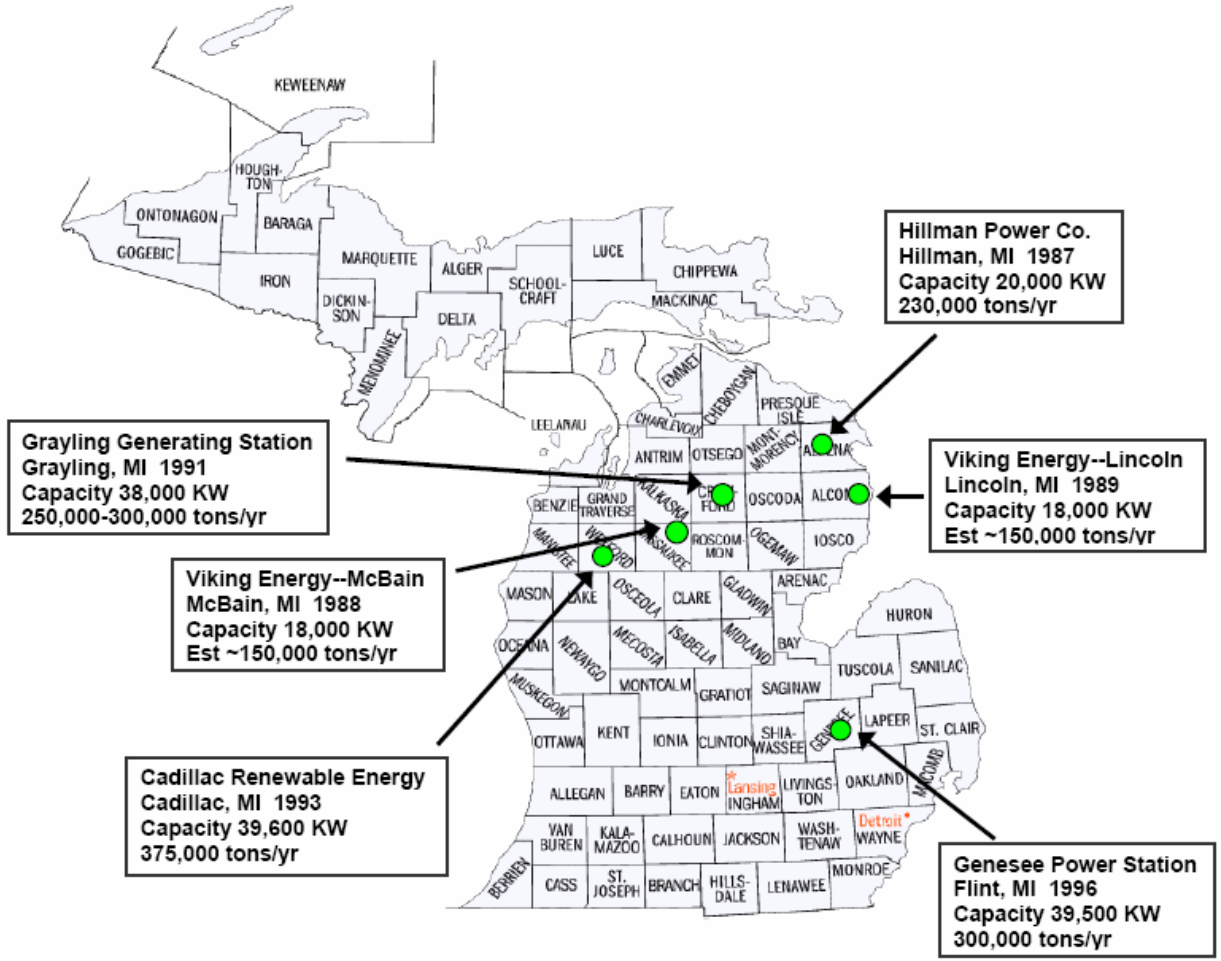


Table 1—Facilities Producing Wood Energy in Michigan

Source: REPiS, online at http://www.nrel.gov/analysis/repis/

Type	Capacity (KW/year)
Michigan Total	368,170
Utility (six sites)	173,100
On-site Upper Peninsula	150,800
On-site Lower Peninsula	44,270

Analyzing Potential for Small, Local Projects:

Statewide Boiler Assessment

Goal: Identify boilers in MI that could be converted to use woody biomass (by either retrofit or replacement)

- Develop database listing boiler characteristics statewide
- Categorize boilers by institution/industry type
- Assess owner interest in biomass energy/conversion and identify contacts
- Prioritize candidates for conversions

(Project of the SE Michigan RC&D, US Forest Service, Michigan DLEG Energy Office, and Michigan DNR)

Competing Markets

- Mulch & hydromulch
- Pulp & paper
- Wood composites
- Landfill cover
- Bulking agents
- Soil amendments
- Animal bedding
- Biofilter media
- Refurbished pallets
- Solid wood milled products

Other Issues

- Location – distinguishing residues from waste
- Landfills and tipping fees
- Transportation
- Harvesting
- Collection
- Processing – drying, chip size requirements

The Future

Emerging Michigan Markets

- Fuel pellets
- Liquid fuels
- Biorefineries

Other Resources

Clean Energy from Wood Residues in Michigan

Michigan Biomass Energy Program
Dulcey Simpkins, Coordinator

Discussion Paper
June 2006

Grant Opportunities & Events

- Woody biomass feasibility grants – funds for on-site engineering assessments in public institutions – see www.semircd.org/ash for more info - DEADLINE is April 16, 2007
- Woody biomass system installation grant (up to $65k) will be announced in May 2007 on www.semircd.org/ash
- Forest Products Society event: “Expanding the Bioeconomy” at DeVos Center in Grand Rapids, May 15, 2007 – see www.fpsgreatlakes.org for more info

Thank you

Great Lakes, Great Times, Great Outdoors

www.michigan.gov